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SANITARY SUGGESTIONS

FOR THE

INFORMATION AND GUIDANCE

OF THE

JEANNETTE SEARCH EXPEDITION.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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LETTER OF TRANSMITTAL.

NAVY DEPARTMENT,
BUREAU OF MEDICINE AND SURGERY,
Washington, May 11, 1881.

SIR: In compliance with the request of Rear-Admiral John Rodgers, President of the Jeannette Relief Board, a copy of which is hereto appended, I have the honor of submitting certain sanitary suggestions for the information and guidance of the proposed expedition, which will prove of essential service in promoting the comfort and in preserving the health and safety of the crew of the U. S. S. Rodgers during her service in the arctic regions.

Very respectfully, your obedient servant,

PHILIP S. WALES,
Surgeon-General U. S. N.

Hon. WM. H. HUNT,
Secretary of the Navy.

NAVY DEPARTMENT,
Washington, March 24, 1881.

GENERAL: I have the honor to request that you will furnish to the Jeannette Relief Board, for the information and guidance of the officers of the proposed expedition, especial information and suggestions relating to the causes, prevention, and treatment of scurvy and snow-blindness under the circumstances of arctic exploration; and with such other information and suggestions as will be likely, in your judgment, to conduce to the health, comfort, and safety of the ship's company.

Very respectfully, your obedient servant,

JOHN RODGERS,
Rear-Admiral and President of the Board.

Surgeon-General P. S. WALES, U. S. N.

SANITARY SUGGESTIONS

FOR THE

INFORMATION AND GUIDANCE OF THE JEANNETTE SEARCH EXPEDITION.

The exacting requirements of arctic life display the cardinal importance of selecting persons of the most vigorous vital powers and highest moral qualities for expeditions, of whatever character, undertaken to penetrate the solitudes and encounter the dangers of high latitudes. The physical and moral qualifications of the *personnel* should be scrutinized minutely, both as regards early history and present condition, with the view of determining these necessary questions. The ages between which these qualities may be found most highly developed are twenty-five and thirty-seven, or during the third and fourth decennaries of life. There should not be manifest any unusual tendency to corpulence or thinness, as both extremes suggest suspicions of defect of health. The physiological proportions of the weight to the height, may be stated generally as within the range of two and two and a half pounds to the inch of stature. Persons of moderate height, between 5 feet 6 inches and 5 feet 10 inches, have usually more endurance than wider ranges. It will be advisable not to select any recruit who presents evidence of any past constitutional disease, particularly scrofula, syphilis, and rheumatism, or tendency thereto, although he may be of apparently robust constitution. The temperament best suited to arctic service is that known as the sanguine; persons of this group are endowed with a more vigorous power of assimilation, active circulation, florid skin, large firm muscles, and capacity for brisk movements and prolonged exertion. Another notable quality is a superior power of eliminating animal heat under low temperatures, so justly esteemed by Sir John Ross of first importance to sojourners in high latitudes. The heat-producing power is possessed in varying degrees by persons of the same seemingly vigorous organization. A degree of extreme cold that would be simply invigorating to one, might produce in another painful or even exhausting depression. This fact is seen in every-day experiences and is referred to by arctic travelers. Unfortunately there is no ready test to determine this desirable quality, yet it may be asserted that it is possessed by northern peoples, Norwegians, Danes, Swedes, Canadians, and New Englanders, in greater degree than those of the south, a circumstance due in part to inherited powers and in part to acquired adaptability. It would be advisable, as far as practicable, to recruit arctic ships from those northern regions and from persons of the type and character above described, particularly from those who have already had experience in arctic traveling. The sanguine temperament finally presents the most useful moral qualities, especially resistance to the depressing influences of prolonged arctic

nights and daily hardships and dangers; it is linked with a humorous, lively, good-natured, and hopeful disposition, so essential to the successful and harmonious prosecution of such enterprises. The reverse of this temperament is that including persons of portly habit, sluggish movement, dark complexioned, with feeble heart power, tardy circulation, and inclined to indulge in gloomy emotions—a class of individuals little fitted for such service.

The sanitary condition of the ship is of no less importance than the procurement of a healthy and vigorous crew; for without the former the latter will soon degenerate, and become as inefficient as a crew originally defective in health. The obtainment of appropriate sanitation is somewhat more difficult in arctic ships than under ordinary circumstances, on account of the extreme cold and prolonged darkness, the ill effects of which are, in some manner, almost irremediable. It is unquestionable that ships intended for this service ought to be built with special reference to the peculiar and exceptional surroundings of arctic voyages, but this has not hitherto been done, and the consummation of this desirable object rests with the future. Ameliorations in the structure of ships of ordinary character may be attended with great success in attaining better conditions of sanitation.

The principal points demanding attention are the heating, lighting, and ventilating contrivances. The most perfect method of heating the living deck of an arctic ship would be by steam coils fitted in appropriate fresh air adits, by means of which air of the proper temperature would be delivered below. This has not yet been realized, and the old plan of warming the air after gaining admission to the apartments prevails exclusively. This is accomplished by steam coils in the most improved vessels, such as have been built as whalers, and of this type is the Rodgers, now destined for the arctic search expedition. The usual or exclusive method of heating, up to the time of Nares' expedition, was by stoves scattered at convenient points around the deck, and communicating with the external air by pipes, a plan which leads to the production of cold draughts, deleterious at once to health and comfort.

On board the *Investigator*, in 1853, what is known as Sylvester's stove was used. This consisted of an ordinary heater, placed in the hold, from which pipes were led into the various apartments to be heated. This was reported as being a good heating apparatus, the consumption of coal being about 70 pounds per diem. On the *Alert* a number of stoves were distributed about the deck and were used as required, sometimes all together. A plan said to answer admirably was adopted in the *Discovery*, of fitting a small stove with hot-water pipes, which gave out a large warming power. The maintenance of heat below will be greatly assisted by building housings over the hatches, and covering the upper deck with snow, one or two feet deep, and, when possible, in winter quarters, by banking it against the ship. The necessity for strict economy in fuel which may arise will often place embarrassing difficulties in the way of obtaining the requisite elevation of temperature for comfortable living. It may be here remarked that it is neither necessary nor desirable to raise the temperature too high. One not exceeding 55° Fah. is perfectly compatible with health and comfort, and avoids at the same time the inconvenient condensation at higher degrees. The temperature of the *Alert* was maintained between 40° and 50° Fah. during the winter.

The proper illumination of arctic ships is a difficult matter. The light gains access below through the sky-lights and bull's-eyes which should be kept in good order. The electric light will furnish a boon of

inestimable benefit during the period of darkness, but has not as yet been utilized to this purpose.

Ventilation of the lower decks must be carefully attended to, but, as may readily be appreciated from the excessively low temperature of the external atmosphere, the very frequent renewal of air heated in the ordinary way after admission is an impossibility. When it is recollected that the volume necessary for health is 3,000 cubic feet every hour, and that the space allowed each person on a ship of 800 tons is only, at most, 150 cubic feet per man, it will be seen that, to insure the former quantity, the air would have to be changed twenty times, which would be impossible, both on account of the intense cold and the draughts that would be engendered. In our temperate latitudes, it cannot be renewed more than six times in this period without the production of damaging currents. The simplest plan is to have tubular ventilators communicating externally, and supplied with proper hoods and valves, by which the quantity of air may be regulated, as the great difference between the temperature of the outside and inside, always from 80° to 100°, will induce very strong currents. The opening and closing of the doors of the hatch-housings in the ordinary routine of ship-work will aid in introducing fresh air. One of the officers of the *Alert* adopted the ingenious plan of connecting his room with the external atmosphere by means of a rubber tube which enabled him to control the supply. No apprehension need be felt from the bilges eliminating odorous or deleterious gases during the winter, as decomposition will be stayed by the low temperature.

A troublesome quality of the air of the living apartments of arctic ships is dampness, proceeding from several causes; from the cutaneous exhalations of the men—and the quantity of this may be appreciated when it is remembered that an ordinary sized person eliminates from 25 to 40 ounces of moisture a day—and from the cooking operations, which, being necessarily conducted below, will supply no inconsiderable amount. These are the constant sources; and then again dampness may be engendered by neglecting to dry the clothing of working parties, or by introducing the hammocks from the low temperature of the upper deck, for the moment they are brought into the warm air of the berth-deck they speedily become wet, and hence the necessity of stowing them below whenever the thermometer falls under zero. Men returning from work should divest themselves of their clothing in the drying room set apart for the purpose, before passing to the living deck. All exposed metal surfaces should be covered with leather, or protected with a coating of cork-composition, which will effectually prevent deposits upon them. The excess of moisture dripping from the beams should be removed with cloths promptly and regularly, which will greatly contribute to both comfort and health. It may be necessary, in order to prevent wetting of the bedclothes in the bunks, to protect them from the dripping by conducting the latter away by a canvas overhang. Various special devices have been adopted by arctic explorers to eliminate the evils of condensation. Sir John Ross caused apertures to be made in the upper deck above the galley, oven and after passages, and over these iron tanks were inverted, into which the vapor passed, became condensed, and was removed in the shape of frozen masses amounting to as much as a bushel a day. To effect the same purpose, dry chloride of lime may be used; five pounds of this, exposed on the deck, will produce a very sensible effect on the humidity of a closed apartment in three hours. Another important circumstance in preventing the deposition freezing, as well as to maintain the heat, is to line the sides of the living deck

with a non-conducting imperishable cloth; in the Nares expedition, the fabric known as the "fearnought" was employed.

Cleanliness, both of the ship and crew, should be maintained as an important auxiliary to health. The deck should be cleansed with hot water, and quickly dried by rubbing; and great advantage will accrue by shel-lacking or painting the decks thoroughly, which will prevent the absorption of moisture by the wood, and at the same time render the cleansing more speedy and effectual. An apartment should be specially set apart for the ablutions of the crew, and this is best located on the lower deck, where hot water may be attainable. Bathing should be made compulsory at least once in two weeks. The clothing of the crew should be washed at stated intervals, once in ten days or two weeks, in the room appropriated for the purpose, and under no circumstances should this work be allowed on the living deck, to supply additional moisture. The bedding may be aired once a month. The men should be provided with a comfortable water-closet, which may be reached from the main deck, when this is housed over, as is always done in winter quarters. It may be constructed of light materials, projecting from the side of the ship; and to exclude draughts and cold the snow may be built quite up to the platform, forming a sort of well. When cleansing becomes necessary, the frozen mass of fecal deposits may be removed with the snow, and a new snow wall raised as before. In this connection it may be mentioned that during sledging expeditions the warm snow hut or tent occupied the night previous for sleeping quarters will serve in the morning for latrine purposes before resuming the march. This convenience will be fully appreciated with a temperature, perhaps, of 50° or 70° below zero.

Regulated exercise is indispensable for the maintenance of health under all circumstances. The intense cold and other incidents of arctic residence, especially during the long dark winter, are disponent to inaction, and hence the necessity to incite the crew to take a sufficient amount of body exercise to ward off disease. The ordinary routine of ship life will usually supply ample range for this purpose in the manifold labors demanded of mariners. In winter quarters, when shipboard work slackens, the men should be encouraged to employ their time in hunting or amusing themselves in pastimes that demand muscular energy. The cooks and servants particularly, who are not usually called upon for active labor, should be looked after and compelled to take open-air exercise. It may be stated, in general terms, that at least five or six hours daily should be occupied in this way, to maintain robust health under the conditions of arctic life. This sort of training, so necessary to health, may be turned to practical advantage by short journeys and the establishment of outlying depots of provisions and stores before the sledging season sets in, when the greatest drafts are made upon the physical energies. While moderate and regular exercise in labor or amusement, as indicated, conduces to health, and powerfully aids the system in warding off scurvy, it must be borne in mind that excess in this particular is equally capable of prostrating the vital powers and inviting scurvy; hence the need of great prudence and judgment not to overtax the men in long journeys, but to give them spells of rest to recruit their strength and energy. By the adoption of this plan long distances have been accomplished by persons worn out by the depressing influences of cold and disease. Whenever the exigencies of service demand extraordinary and long-sustained exertions, as frequently occur in arctic experiences, extra rations of tea or cocoa should be issued.

As regards clothing, stout woolen underwear is recommended as possessing more advantages than garments made of other fabrics, although persons of experience in arctic service have used with satisfaction materials of chamois and silk for this purpose. For coat and trousers, a fine textured, thick, and elastic material should be employed, and when occasion demands, these should be supplemented by the warm and durable garments of fur, such as are used by the Esquimaux.

In the sledging parties, the head can best be protected by a close-fitting woolen cap, shielding the ears, and over this the usual sealskin covering. The feet should be enveloped by woolen stockings reaching above the knee, covered with flannel or blanket wrappers, and over these, boots or, preferably, skin moccasins of the Esquimaux, fitted with leggins. For the hands, woolen mittens with sealskin outer covering will serve all the purposes of convenience and comfort. Much satisfaction will be derived from the use of a wide flannel roller encircling the belly.

Not less notable in arctic life is the character of the mental and moral impressions for good or for evil. Cheerfulness should be cultivated by all practical means, and intellectual tastes catered to by such diversions as are readily attainable by developing the various qualities possessed by the men composing the ship's company. Theatrical displays, orations, recitations and musical entertainments are among the most advantageous methods that can be had recourse to for the purpose of counteracting the tendency to mental despondency, so common during the season of arctic darkness, and from which, according to Kane, the dogs themselves are not exempt.

The sanitary precautions above all others in importance to sojourners in high latitudes refer to food supplies. Failure in the proper quantity and quality of these is sure to impair the strength of the men and invite disease, especially when conjoined with absence of sunlight, dampness, impure air, low temperature, defective cleanliness, want of exercise, and mental despondency. The diet should be as varied as the circumstances of the situation will admit, and should consist of a due proportion of animal and vegetable food. Rations of fresh meats should be served out from the regular supplies as often as four times a week. This may be done oftener with advantage when such food can be procured by the chase; any opportunity presenting for such extrinsic supplies should be embraced with the view of economizing the ordinary provisions and as affording preventive materials against scurvy. Such supplies are offered by the musk ox, polar bear, rabbits, ptarmigan, and the various species of waterfowl and their eggs. The seal, walrus, porpoise, and whale may also be depended upon as valuable sources of fresh meat which need no particular means of preservation as long as the temperature remains below the freezing point. Walrus meat enjoys a high reputation among the Esquimaux as an anti-scorbutic. Soups should never be substituted for meat, but may be appropriately used as adjuncts. With the animal food, regular rations of canned vegetables and fruits should be served. One of the most valuable anti-scorbutic substitutes for fresh succulent vegetables is lime juice, which should be supplied the men daily in the quantity of one ounce mixed with an equal weight of sugar. It is recommended that the issue of lime juice begin after leaving port, when the supplies of fresh vegetables have been exhausted, and that an officer should see that each man has taken the prescribed quantity. This last suggestion is important, since, if it is left to individual caprice or fancy, it may be neglected. Acid wines and spruce beer (the latter may be prepared on ship-board) are valuable agents in preventing scurvy.

It may be well to note the fact, in the event of loss or expenditure of

the ordinary supplies of succulent vegetable food and anti-scorbutics, that, in the highest regions yet attained, there may be found plants possessing in some degree anti-scorbutic power, such as scurvy grass, sorrel, reindeer moss, and others; but neither large nor regular supplies can be obtained. The same remark also applies to the two most easily cultivable annuals, cress and mustard, as the dearth of room and the deteriorating influence of darkness impose restrictions upon their quantity and quality.

Other reputed anti-scorbutic remedies have been furnished the ship with the view of determining their influence should suitable opportunities offer. The indispensable necessity of lime juice in the sledging parties, and the difficulties of carrying and preparing it for use, suggested the propriety of combining the juice and pemmican in the proportion of one ounce to the pound of the latter. A large quantity of this preparation has been furnished for use in the sledging parties, and it is believed that great advantage will accrue from it. The pemmican is greatly improved in taste and flavor and will, I believe, be more assimilable. To avoid delay and labor under similar circumstances in serving out the food, I recommend that single rations of articles, particularly tea, which should be compressed, shall be prepared before the sledges leave the ship.

An admirable article of lime-juice, prepared by evaporation in shallow earthenware pans, at a temperature not exceeding 140°, has also been furnished for traveling parties. It presents the consistence of a semi-solid, and when dissolved possesses the properties of the juice unimpaired. Each pound represents a gallon of the solution of the ordinary strength, so that this quantity will supply the proper ration for eight men sixteen days; a single ration when frozen will not exceed a walnut in bulk.

The following tables show the sledge ration of the Nares expedition and the proposed one:

British dietary.			Proposed dietary.		
Per day, per man:		Lbs. Ozs.	Per day, per man:		Lbs. Ozs.
Pemmican	1	0 ..	Lime juice {	1	0
Biscuit	14	..	Pemmican }	14	14
Bacon*	4	..	Biscuit	2	2
Potato	2	..	Cheese	4	4
Rum (fluid ounces)	2½	..	Dried potato	1	1
Chocolate	1	..	Dried onions	1	1
Sugar for chocolate	½	..	Tea	2	2
Tea†	½	..	Sugar	1	1
Sugar for tea	1½	..	Condensed milk	4 fl. oz.	4 fl. oz.
Stearine	3	..	Alcohol or petroleum ‡	½	½
Spirits of wine	1	..	Tobacco	½	½
Tobacco	½	..	Salt	½	½
Salt	½	..	Pepper	2½	2½
Pepper	2½	..	Curry powder	½	½
Onion or curry powder	½	..			
Total weight	2	14.9	Total weight	2	13.5

* Increased in some cases to 6 ounces, at request, in lieu of pemmican.

† Double allowance of tea was carried in lieu of rum.

‡ Four fluid ounces alcohol, of 75 per cent. will weigh about 3½ ounces avoirdupois.

Average load hauled by each man on leaving ship, 234½ pounds.

It will be observed that spirits have been altogether omitted from the proposed dietary, tea, this having been decided by an immense majority of arctic travelers to be more advantageous as a comforting and strengthening beverage, and upon which more work can be done. Condensed milk and egg-powder would be valuable additions to the sledge dietary.

It is believed that a close adhesion to the sanitary suggestions now made will remove any danger of the occurrence of scurvy during the service of the United States steamer Rodgers in the arctic regions.

In this connection it will be proper to call attention to the common diseases and injuries liable to occur, that they may be speedily recognized and treated by those in charge of the sledging parties when unaccompanied by a medical officer, as must necessarily often happen.

Scurvy is one of the most redoubtable enemies of the arctic resident. It consists of a peculiar alteration in the properties of the blood, which becomes impoverished in nourishing materials by errors in diet, the most immeasurably frequent of which is the absence of succulent vegetable matter. The disease begins insidiously, the skin assuming a yellowish or earthy hue, is dry, rough, and unperspiring. Dark red or brownish flecks of small size and round outline break out on various parts of the body, and later the discoloration presents large purple blotches; the gums are tender, swollen, and of a dark color, bleed readily, and separate from the teeth; pains in the joints of the legs, particularly in the hams, are generally complained of, and are often being confounded with rheumatism. There are muscular weakness and feeling of lassitude, ordinary exertion producing exhaustion, palpitation of the heart, and breathlessness. The mind partakes in the general debility of the body, and there is more or less disposition to despondency. In the more confirmed stages of the disease, swellings occur in the hams and other parts from the bloody and fibrinous effusions, and the bones and internal organs suffer in various degrees. These are the salient points in scurvy, and every precaution should be adopted to detect its presence at the earliest moment, especially by a periodical monthly examination after the ship is settled in winter quarters. It should be remembered that paleness of the countenance is an inseparable circumstance in those who have spent a winter in the arctic regions. There is nothing like acclimatizing a European, for experience has shown that in every expedition the crews have been more sickly the second than the first year.

It is particularly important to examine the men selected for sledging parties, to see that they are free from scorbutic taint, inasmuch as the hard work incident to this service would inevitably disqualify a person with such tendencies in a brief period, and embarrass the party with an invalid. The proper means of preventing this disease have been already fully indicated.

The next most frequent trouble in the arctic region is frost-bite. The men in the sledging parties are most obnoxious to this disqualification. It approaches insidiously and should be early recognized and treated to prevent funest results. The men should be frequently asked if they perceive loss of sensation in any part of their bodies, as frost-bite may occur unawares, especially on a sudden rise of temperature. If on examining the part it presents alteration in color to a dull waxy or purplish livid hue, with the formation of vesication or bladders, an effort should be made at once to restore the circulation slowly by frictions with the hands, or rubbing the part with melting snow, or plunging it into cold water for some time. When the circulation is established, dress with glycerine and cotton batting, and cover the whole with a bandage. Great care should be taken not to use stimulating applications at first, otherwise acute inflammation, followed perhaps by mortification, will result. Should these efforts fail of success, the frost-bitten part should be dressed with carbolized cosmoline and

cotton batting, and the patient made as comfortable as possible, being placed, in case the legs and feet are affected, in a sledge.

In very cold weather the face-cloth should be worn, and traveling by night adopted as far as can be done, so as to enable the men to sleep during the day, when there is less likelihood, from the higher temperature, of frost-bite. It is advised, to prevent the effects of cold upon the exposed surfaces, to rub them with unctuous applications as cosmoline. To avoid the action of the drinking vessels upon the lips, the rims should be rubbed with the gloved hand.

The glare of snow upon the eyes produces the condition known as snow-blindness, particularly in traveling during the spring and summer months. To prevent its occurrence when the sun reappears, the men should be provided with goggles of neutral-tinted glass, and on the march or in sledging parties a dark patch may be affixed to the backs of the men, upon which, when in line, the eyes may be directed instead of upon the snow. The leading man on the drag-ropes should be changed frequently to the rear, and the eye-lids may be smeared with charcoal and grease.

Sometimes sledge labor causes exhaustion and fainting, and when a case of this sort occurs the person should be immediately placed upon his back, with the head low, and the clothes about the neck loosened. He should be given a little warm tea, a teaspoonful of aromatic spirits of ammonia or brandy, and allowed to rest for a while. The occurrence of perfect unconsciousness and of complete exhaustion requires the person to be at once removed to the tents, rubbed with hot flannels, and the above-mentioned stimulants given from time to time until he recovers. He should then be dressed warmly and allowed to rest in his sleeping bag for a few hours. To meet the emergencies of accidents and diseases of a slight character, which sometimes occur in the sledging journeys, the officers in command should be instructed by the surgeon of the vessel in the application of simple means, and suitable supplies for these purposes furnished.





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